

OIL RECOVERY SYSTEM

Foster-Miller Associates, Inc., mechanical engineering and design consultants located in Waltham, Massachusetts, has developed a Downhole Steam Generation System for use in heavy oil recovery projects; it delivers high pressure steam to bring up oil from reservoirs as much as 3,000 feet below the surface. Developed under contract to Sandia Laboratories and the Department of Energy, the system consists of a steam generator, a "packer" that keeps the steam from leaking up the wellbore, and a tube string that supplies air, fuel, water and hydraulics to the generator and packer; all are encased in a standard seven-inch well casing.

The term "downhole" means that the steam generator is located far down the well casing rather than on the surface, as in conventional steam pressure

recovery systems. Foster-Miller believes that, for recovery from deep reservoirs of heavy oil, the downhole design offers time and cost savings over surface generated steam.

The photo provides an inside look at the downhole combustion zone. In the combustor, fuel is injected through a nozzle and burned in the presence of pressurized air. The combustor is designed to provide a high degree of flame stability as well as long residence time for the combustion products, key factors in the efficiency of the system. In designing the system, Foster-Miller used a computer program from the inventory of NASA's Computer Software Management and Information Center (COSMIC) in an extensive analysis of the combustor section. The company reports that the COSMIC program was the only one available that could provide the requisite calculations relative to combustor efficiency over a wide range of thermodynamic conditions.

